Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 18 (5): 949–955
https://doi.org/10.15560/18.5.949

PENSOFT

First record of *Eurystyles actinosophila* (Barb. Rodr.) Schltr. in the Central-West region of Brazil and notes on distribution of *Eurystyles* and *Lankesterella* (Orchidaceae, Spiranthinae) in Brazil

José Herlânio de Lima[1*], Viviane Vaz de Queiroz[1], Luciano de Bem Bianchetti[2]

1 University of Brasilia, Department of Botany, Brasília, DF, Brazil • JHL: jhlimacoffeholic@gmail.com https://orcid.org/0000-0002-3837-9357 • VVQ: vivi.vqueiroz@gmail.com

2 EMBRAPA - Brazilian Agricultural Research Corporation, Brasilia, DF, Brazil • LBB: luciano.bianchetti@embrapa.br

* Corresponding author

Abstract

We report the first record of *Eurystyles actinosophila* (Barb.Rodr.) Schltr. and the genus *Eurystyles* Wawra (Orchidaceae) in the Central-West region of Brazil. The species was found in the Brasília National Park, in Brasília, Distrito Federal, in the core region of the Cerrado. We also undertook a survey of collection sites in Brazil for species of *Eurystyles* and *Lankesterella* Ames, which together form the epiphytic clade of Spiranthinae, in order to create an updated distribution map. Previously identified only in the Atlantic Forest and Pampa, we note that some species of these two genera also occur in the Cerrado and Caatinga domains.

Keywords

Atlantic Forest, Caatinga, Cerrado, geographic distribution, *Lankesterella*, riparian forest

Academic editor: Rosa del C. Ortiz | Received 27 May 2022 | Accepted 31 August 2022 | Published 12 September 2022

Citation: Lima JH, Queiroz VV, Bianchetti LB (2022) First record of *Eurystyles actinosophila* (Barb. Rodr.) Schltr. in the Central-West region of Brazil and notes on distribution of *Eurystyles* and *Lankesterella* (Orchidaceae, Spiranthinae) in Brazil. Check List 18 (5): 949–955. https://doi.org/10.15560/18.5.949

Introduction

The Orchidaceae Juss. comprise 27,801 species grouped into 736 genera (The Plant List 2013; Chase et al. 2015), and it is divided into five subfamilies: Apostasioideae (the most basal subfamily, restricted to tropical Asia), Cypripedioideae, Vanilloideae, Orchidoideae, and Epidendroideae (Cameron et al. 1999; Freudenstein et al. 2004; Kocyan et al. 2004; Chase et al. 2015). Representatives of this family are distributed in all terrestrial habitats, except in the driest deserts and on the Antarctic continent (Givnish et al. 2016). In Brazil, Orchidaceae are represented by 2,692 species, of which 642 occur in the Cerrado domain, and 241 in the Distrito Federal, seat of the capital of the country (Flora do Brasil 2020).

The Distrito Federal is completely inserted in the Cerrado domain, where grassland and savannah vegetation predominate, with few areas occupied by forest formations (Ribeiro and Walter 2008). Due to these characteristics, terrestrial species of Orchidaceae are more numerous than epiphyte species (Batista and Bianchetti 2003). Among the four subfamilies represented in the Distrito Federal, the most numerous is Orchidoideae, with 21 genera and 111 species, and the richest genus

is *Habenaria* Willd., with 70 species (Flora do Brasil 2020). Among the Orchidoideae genera with exclusively epiphytic representatives are *Eurystyles* Wawra and *Lankesterella* Ames (Salazar and Dressler 2011). Of these, only the first genus, represented by *E. ochyrana* (Szlach. et al.) F. Barros and L. Guimarães, is found in the Cerrado, where it is is known from the Serra de Botucatu, Itatinga, São Paulo (Szlachetko et al. 2001), in the transition with the Atlantic Forest domain. The other species of these genera occur in the Brazilian Atlantic Forest and Pampa domains (Flora do Brasil 2020).

Molecular phylogenic studies have shown that *Eurystyles* and *Lankesterella* form a basal clade with strong support and high bootstrap percentages (Salazar et al. 2018). There are 20 species of *Eurystyles*, all restricted to the Neotropics, distributed from Mexico throughout the Caribbean and Central America to South America, except Chile and Uruguay. Eleven species of *Eurystyles* are found in Brazil (Pridgeon et al. 2003; Flora do Brasil 2020; Ackerman and Jordan 2021; Govaerts 2021). *Lankesterella*, with 11 species, occur in Cuba, Dominican Republic, Costa Rica, and South America, and have the same distribution as *Eurystyles*. Seven species of *Lankesterrella* occur in Brazil (Flora do Brasil 2020; Govaerts 2021).

Plants of these two genera resemble "small bromeliads" due to their rosulate leaves (Bogarín 2020). Vegetatively, these genera are difficult to separate and are characterized by having fasciculate, fleshy, and puberulous roots. Their leaves are ovate-lanceolate to oblanceolate, glossy, with ciliated margins, and last through many growing seasons (Górniak et al. 2006; Salazar and Dressler 2011). Although they are quite similar, representatives of these genera can be vegetatively differentiated by root trichomes, which are spiraled in *Eurystyles* and simple in *Lankesterella* (Bernal et al. 2015). Reproductive structures differ greatly, however, and in *Eurystyles*, the inflorescence consists of a condensed (capitate) raceme with non-resupinated flowers arranged in a spiral, whereas in *Lankesterella* the raceme is lax with resupinate and secund flowers, that is, arranged on only one side (Burns-Balogh et al. 1985; Górniak et al. 2006; Salazar and Dressler 2011).

So far, the only record of the genus *Eurystyles* from the Cerrado was collected less than 2 km from the Atlantic Forest. Here, we present the first record of this genus from the core region of the Cerrado, approximately 550 km from the edge of the Atlantic Forest. This record also consists of the first collection of *Eurystyles* for the Central-west region of Brazil. Furthermore, we discuss the expanded distribution in Brazil of *Eurystyles* and *Lankesterella*, which form the clade of epiphytic species of the subtribe Spiranthinae (Cranichidae, Orchidoideae).

Methods

We carried out a floristic survey in 2014 and 2015 in the gallery forest (sensu Ribeiro and Walter 2001) along the Acampamento stream located in Brasília National Park. There, we recorded the occurrence of *Eurystyles actinosophila* (Barb. Rodr.) Schltr. Some specimens were collected and kept in cultivation in the greenhouse of the Centro de Referência em Conservação da Natureza e Recuperação de Áreas Degradadas of the University of Brasilia (CRAD/UnB) until flowering. Afterwards, the flowering individuals were herborized according to IBGE (1991) methods and deposited in the herbarium (UB) in the Distrito Federal.

The national park is located at an altitude of 1,100 m, in the core region of the Cerrado known as Planalto Central (coordinates of the park's headquarters: 15°44′02″S, 047°55′30″W). In the Köppen climate classification, the region is AW, with annual precipitation of 1,300–1,600 mm and an annual average temperature of 20–22 °C, with minimum and maximum values of 10.1 °C and 36.4 °C, respectively, in 2020 (Alvares et al. 2014; INMET 2021).

The herborized material was compared with collections of UB, CEN, HEPH and IBGE herbaria (acronyms according to Thiers 2021), as well as with other materials on the Specieslink (2021) platform. We consulted the specialist literature to assist in the species' identification: Burns-Balogh et al. (1985), Miller and Warren (1996), Salazar and Dressler (2001), Menini Neto et al. (2004a, 2004b), CRIA (2005), Górniak et al. (2006), Abreu and Menini Neto (2010), Pessoa and Alves (2015), Vieira and Barros (2017). Furthermore, protologues were consulted at the Biodiversity Heritage Library (www.biodiversitylibrary.org) and at Botanicus (www.botanicus.org). We use the morphological terminology of Radford et al. (1974), Weberling (1992), Bell and Bryan (2008), and Gonçalves and Lorenzi (2011). Occurrence data were obtained from Specieslink (2021) and species protologs. Finally, we generated the maps using QGis v. 2.18.0, and specimens were photographed with a Nikon 3200 camera (18–55 mm Nikkor lens) and an Opticam EOPT20003_ISP camera (35 mm) coupled to an Opticam OPZTS stereomicroscope. The authorization for collection of specimens was granted by the Instituto Chico Mendes da Biodiversidade (ICMBio no. 42598-4/2014).

Results

***Eurystyles actinosophila* (Barb.Rodr.) Schltr.**
Figures 1, 2

New record. BRAZIL – **Distrito Federal** • Brasilia, Parque Nacional de Brasília, Mata do Córrego do Acampamento; 15°45′40″S, 047°58′41″W, 25.VI.2014, V.V. Queiroz & J.H. Lima 12, UB 205546.

Identification. Epiphytic herb, 3.0–3.5 cm tall. Sympodial growth. Tuberiform and fasciculate roots. Inconspicuous rhizome. Sessile leaves 1–4 × 0.5–1.5 cm, rosulate, spatulate to ovate, acuminate, ciliate margin.

Figure 1. *Eurystyles actinosophila* in situ in Brasília National Park, Distrito Federal, Brazil. Photograph by J.H. Lima.

Terminal inflorescence, spiked, capituliform, congested, pendant. Peduncle 1.3–3.0 cm long, hairy; bracts of peduncle ca. 10 × 4 mm, lanceolate to rhombic, acute apex; floral bracts 7–11 × 2–4 mm, rhombic to lanceolate, ciliate margin, acute apex. White flowers, greenish sepals from base to middle, externally pubescent, sessile; dorsal sepal 4.0 × 1.5 mm, lanceolate, connate to the lateral sepals at the base, cuneate apex, curved; lateral sepals 4.5 × 1.5 mm, lanceolate to oblanceolate, cuneate apex, smoothly curved; petals 3.0–3.5 × 0.5 mm, white, oblong to oblanceolate, cuneate apex to smoothly rounded, curved; labellum ca. 5 × 3 mm, white, triangular, trilobulated, lateral lobe with two projections facing backwards, median lobe cuneate to rounded, curved. Gynostemium ca. 3 mm long, with two lateral projections (arms) in the subapical region; anther ca. 1.5 mm long, brown, dorsal, falcate, acute apex; conical rostellum, membranous. Pollinia 2, ca. 1 × 0.5 mm each, brownish-beige. Ovary ca. 3.5 × 1.5 mm, green, occasional hairs. Fruit not seen.

Distribution. With our new record of *E. actinosophila* this species is confirmed from both the Distrito Federal and the Central-West region of Brazil (Fig. 1). The data obtained on the distribution of *Eurystyles* and *Lankesterella* reveal that these genera have a wider distribution than has been described in the literature (Fig. 2; Table 1). The distribution of three species, *E. actinosophila*, *E. cotyledon* Wawra, and *L. ceracifolia* (Barb.Rodr.) Mansf. is expanded to the Caatinga and Cerrado domains. On the other hand, the distribution of *E. lorenzii* (Cogn.) Schltr. is expanded to the Cerrado and Pampa domains.

Discussion

Eurystyles actinosophila is very similar to *E. cotyledon*, occurring in sympatry in some localities (Miller and Warren 1996; Zandoná and Catharino 2015). Also, according to Miller and Warren (1996), *E. actinosophila* has dark green and very shiny leaves. In contrast, in *E. cotyledon* the leaves are paler green and even translucent (Fig. 3), which was observed by Wawra (Heinrich 1863). Furthermore, Miller and Warren (1996) noted that *E. actinosophila* has shorter and wider leaves (ca. 3.5 × 1.5 cm), while *E. cotyledon* has longer and narrower leaves (ca. 4 × 1 cm). Another feature distinguishing these two species is the curved sepals in *E. actinosophila* (Rodrigues 1881; CRIA 2005) (Fig. 4A-C). Finally, *E. actinosophila* has a trilobulated labellum, with a lanceolate or rounded epichile (Fig. 4F, G), and *E. cotyledon* has a unilobulated labellum (Rodrigues 1881; Miller and Warren 1996; CRIA 2005; Abreu and Menini Neto 2010).

According to current distributional data, *Eurystyles* and *Lankesterella* are found only in the Atlantic Forest and Pampa domains, except for *E. ochyrana*, which occurs in the Cerrado (Flora do Brasil 2020). *Eurystyles actinosophila* had already been collected in the Cerrado in 1989 and 2005 (Table 1), but these data have not been published. Therefore, our record of this species from Distrito Federal extends the distribution to another region of Brazil. The closest collection to Distrito Federal

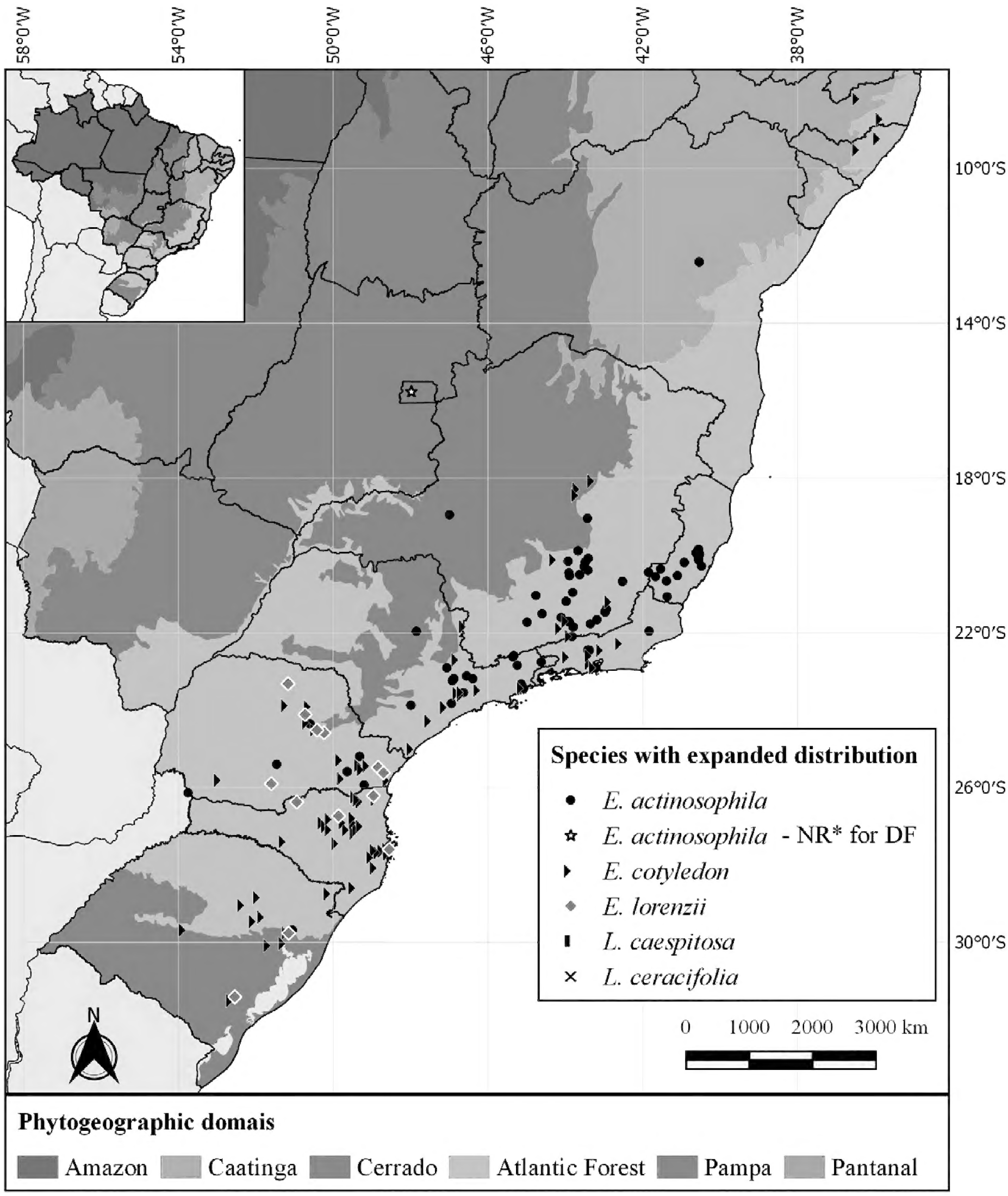

Figure 2. *Eurystyles* and *Lankesterella* species with their expanded distribution to other phytogeographic domains and a new record (NR*) of *E. actinosophila* in Distrito Federal, Brazil.

was from Patrocínio municipality in the state of Minas Gerais, approximately 370 km away. Our new Cerrado record from São Paulo state is approximately 35 km from the transition Cerrado and Atlantic Forest domains. In Bahia state, *E. actinosophila* was collected in Caatinga roughly 90 km from the transition to the Atlantic Forest.

There are unpublished occurrences of *E. lorenzii* from the Cerrado and Pampa biomes (Table 1). In the Cerrado of the state of Paraná, this species occurs less than 10 km from the border of the Atlantic Forest. In the Pampa, there is a record approximatley 170 km from the transition with the Atlantic Forest. *Eurystyles cotyledon* has been collected in the transition zone between Cerrado and Atlantic Forest in Minas Gerais and Paraná states. In the Caatinga, this species was found 40 km from the Atlantic Forest.

Lankesterella caespitosa and *E. actinosophila* have been collected in the Cerrado at the same location in São

Table 1. Collections of *Eurystyles* and *Lankesterella* in other Brazilian phytogeographic domains not reported in the literature.

Species	Collector/year; collection code	County, state	Domain
E. actinosophila	A.E.H. Salles, M.M. Augusto 1569/1989; HEPH 6939	Patrocínio, MG	Cerrado
E. actinosophila	A.W.C. Ferreira s.n./2005; SPSC 7381	São Carlos, SP	Cerrado
E. actinosophila	L. P. de Queiroz 10823/2005; CEPEC 118827	Itaberaba, BA	Caatinga
E. cotyledon	Chagas, Mota 10800/2011; MAC 52710	Flexeiras, AL	Caatinga
E. cotyledon	L. Menini Neto et al. 198/2006; CESJ 47685	Felício dos Santos, MG	Cerrado
E. cotyledon	E.L.F. Menezes 215/2020; HDJF 7886	Diamantina, MG	Cerrado
E. cotyledon	F. Barros 192/1980; SP 232353	Datas, MG	Cerrado
E. lorenzii	W.S. Mancinelli 1064b/2009 ; UPCB 67338	Tibagi, PR	Cerrado
E. lorenzii	W.S. Mancinelli 1354/2010; UPCB 72401	Tibagi, PR	Cerrado
E. lorenzii	C. Orth S.J. s.n./1936; PACA 1947	São Leopoldo, RS	Pampa
E. lorenzii	T. Perleberg 281/2008; ECT 1702	Pelotas, RS	Pampa
L. caespitosa	G. Edwall CGG6008/1901; SP 30031	Itirapina, SP	Cerrado
L. ceracifolia	J.A.N. Batista 623/1996; CEN 25426	Lençóis, BA	Caatinga
L. ceracifolia	G. Hatschbach, O. Guimarães 14679/1996; MBM 1234	Tibagi, PR	Cerrado
L. ceracifolia	E.L.F. Menezes 282/2020; HDJF 7940	Bocaiúva, MG	Cerrado

Figure 3. Habit of *Eurystyles actinosophila* and *E. cotyledon*. **A, B.** *E. actinosophila*. **C**. *E. cotyledon*. **A.** New record for Distrito Federal (V.V. Queiroz & J.H. Lima 12, UB 205546). **B.** Flora do Brasil (2020). **C.** (P. Schwirkowski 1617, FPS 2140). Photographs: A. by J.H. Lima; B. by L. Menini-Neto; C. by P. Schwirkowski.

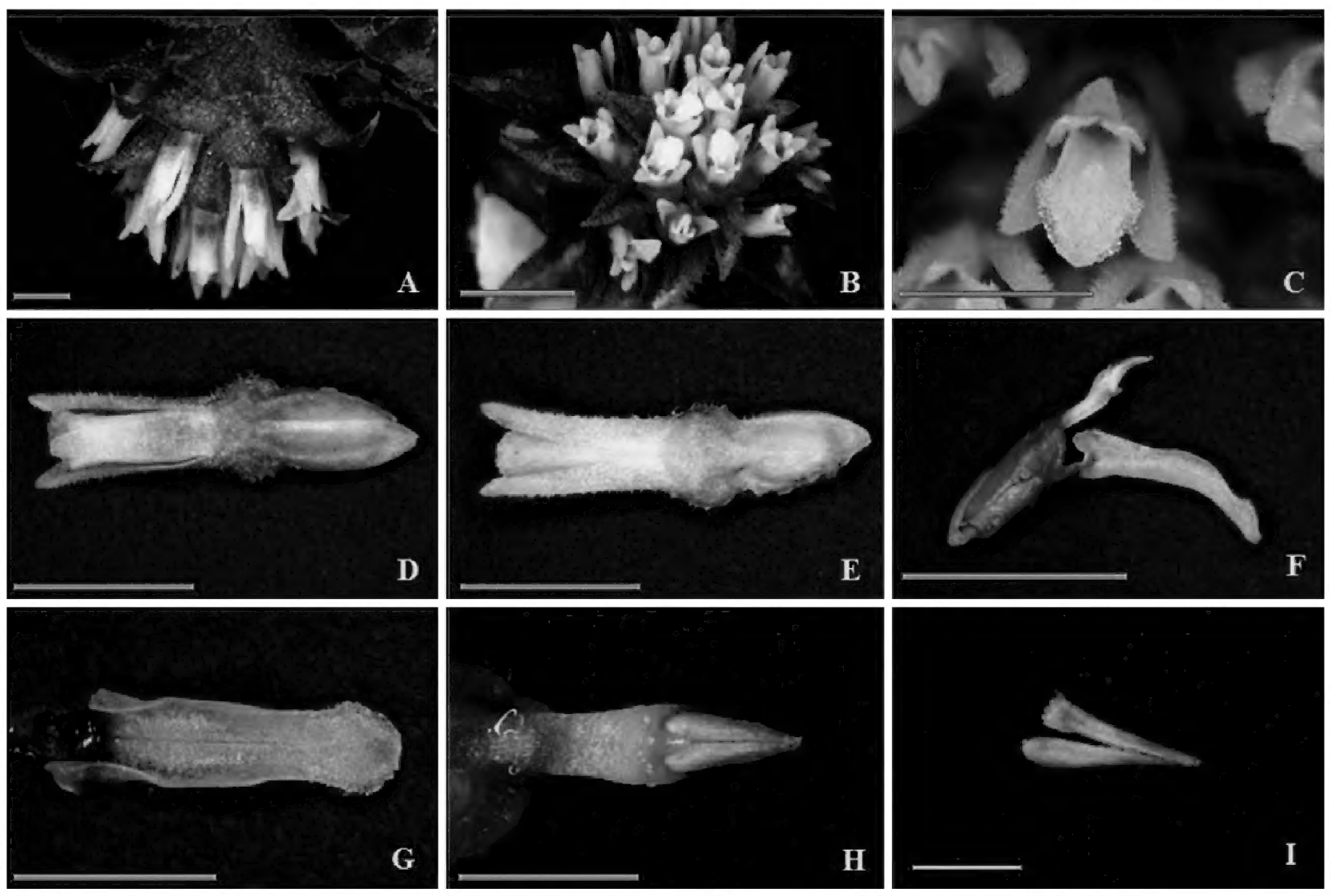

Figure 4. Floral morphology of *E. actinosophila*. **A, B.** Inflorescence in lateral and frontal views, respectively. **C-E**. Flower in frontal, ventral and dorsal views, respectively. **F.** Flower in lateral view with petals and sepals removed. **G.** Detached flower labelum. **H**. Gynostemium. **I.** Pollinia. Scale bars: A, B, D–F = 5 mm; C, G = 3 mm; H = 2 mm; I = 1 mm. Photographs by J.H. Lima and L.B. Bianchetti.

Paulo state, approximately 25 km from the border of the Atlantic Forest. *Lankesterella ceracifolia* has been collected in the Cerrado of two states, Minas Gerais and Paraná, respectively, 70 km from the Atlantic Forest and at the border of this domain. In the Caatinga, *L. ceracifolia* was recorded 130 km inland from the transition of the Caatinga and Atlantic Forest biomes.

Our new record of *E. actinosophila* from the Center-West region reveals that even in well-sampled areas such as Distrito Federal, it is still possible to find unreported species, for example, the two conspicuous bromeliads *Vriesea friburgensis* Mez. and *Tillandsia polystachia* (L.) L. (Lima and Soares-Silva 2016). Other records in well-sampled areas worth mentioning include that of *E. lobata* Chiron & V.P. Castro from Santa Catarina state (Guimarães et al. 2016); this species was known from a single record Espírito Santo state, and five new occurrences of *Tillandsia* L. from Bahia state (Leodegario et al. 2021). This highlights the importance of the periodic study of collections in herbaria and the systematic return to areas already sampled.

The range extensions of some species of *Eurystyles* and *Lankesterella* to the Cerrado reinforces the biogeographic relationships of this domain with the Amazon and Atlantic Forest (Batalha-Filho and Miyaki 2014). Furthermore, the presence of these species in the Cerrado corroborates the belief that in the past forests in northwestern and southeastern of Brazil were connected by the gallery forests of the Cerrado (Oliveira-Filho and Ratter 1995). These gallery forests would have been the bridge for the Spiranthinae from southeastern Brazil to colonize the American continent. According to Salazar et al. (2018), despite the epiphytic habit (Ackerman 1983), *Eurystyles* and *Lankesterella* form the most basal clade of the American Spiranthinae, whose origin would have been the Atlantic Forest. Thus, we expected that it is only a matter of time before species of these genera are found in the Brazilian Amazon, as there are several species to the north of the Amazon and in Central America.

Acknowledgements

Viviane Vaz de Queiroz acknowledges the support of Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq 562340/2016-6). We thank Dr. Lucia Helena Soares e Silva for the critical reading of the manuscript and for her suggestions. We thank the Chico Mendes Institute-ICMBIO for the granting of the collection license. We also thank Dr. Diego Borarín and the editor, Dr. Rosa del C. Ortiz-Gentry, for their valuable comments and suggestions.

Authors' Contributions

Conceptualization: JHL, LBB. Data curation: JHL. Formal analysis: VVQ. Investigation: JHL, VVQ. Methodology: JHL. Software: JHL. Supervision: LBB. Visualization: JHL. Writing – original draft: JHL. Writing – review and editing: LBB, VVQ.

References

Abreu NL, Menini Neto L (2010) As subfamílias Vanilloideae e Orchidoideae (Orchidaceae) em um fragmento da Serra da Mantiqueira, Minas Gerais, Brasil. Boletim de Botânica da Universidade de São Paulo 28 (1): 15–33.

Ackerman JD (1983) On the evidence for a primitively epiphytic habit in orchids. Systematic Botany 8 (4): 474–477.

Ackerman JD, Jordan LO (2021) A new species of *Eurystyles* (Orchidaceae) is exposed by a fierce hurricane in Puerto Rico. Lankesteriana 21 (1): 45–50. https://doi.org/10.15517/lank.v21i1.46803

Alvares CA, Stape JL, Sentelhas PC, Gonçalves JLM, Sparovek G (2014) Köppen's climate classification map for Brazil. Meteorologische Zeitschrift 22 (6): 711–728. https://doi.org/10.1127/0941-2948/2013/0507

Batalha-Filho H, Miyaki CY (2014) Evolutionary processes in the Amazon and Atlantic Forest. Fronteiras: Journal of Social, Technological and Environmental Science 3 (2): 34–44.

Batista JAN, Bianchetti LBB (2003) Lista atualizada das Orchidaceae do Distrito Federal. Acta Botanica Brasilica 17 (2): 183–201.

Bell AD, Bryan A (2008) Plant form: an illustrated guide to flowering plant morphology. 2nd edition. Timber Press, Portland, USA, 432 pp.

Bernal AA, Smidt EC, Bona C (2015) Spiral root hairs in Spiranthinae (Cranichideae: Orchidaceae). Brazilian Journal of Botany 38: 411–415. https://doi.org/10.1007/s40415-015-0141-2

Bogarín D (2020) A new species of *Eurystyles* (Orchidaceae: Spiranthinae) from Costa Rica. Blumea 65: 65–68. https://doi.org/10.3767/blumea.2020.65.01.07

Burns-Balogh P, Robinson H, Foster MS (1985) The capitate-flowered epiphytic Spiranthinae (Orchidaceae) and a new genus from Paraguay. Brittonia 37: 154–162.

Cameron KM, Chase MW, Whitten WM, Kores PJ, Jarrell DC, Aalbert VA, Yukawa T, Hills HG, Goldman DH (1999) A phylogenetic analysis of the Orchidaceae: evidence from rbcL nucleotide sequences. American Journal of Botany 86 (2): 208–224.

Chase MW, Cameron KM, Freudenstein JV, Pridgeon AM, Salazar G, van den Berg C, Schuiteman A (2015) An updated classification of Orchidaceae. Botanical Journal of the Linnean Society 177: 151–177.

CRIA (2005) Flora Brasiliensis. http://florabrasiliensis.cria.org.br/. Accessed on: 2020-05-15.

Flora do Brasil (2020) Flora do Brasil 2020. Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil. http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB6361/. Accessed on: 2020-05-15.

Freudenstein JV, van den Berg C, Goldman DH, Kores PJ, Molvray M, Chase MW (2004) An expanded plastid DNA phylogeny of Orchidaceae and analysis of jackknife branch support strategy. American Journal of Botany 91 (1): 149–157.

Givnish TJ, Spalink D, Ames M, Lyon, SP, Hunter SJ, Zuluaga A, Doucette A, Caro GG, McDaniel J, Clements MA, Arroyo MTK, Endara L, Kriebel R, Williams NH, Cameron KM (2016) Orchid historical biogeography, diversification, Antarctica and the paradox of orchid dispersal. Journal of Biogeography 43: 1905–1916. https://doi.org/doi:10.1111/jbi.12854

Gonçalves EG, Lorenzi H (2011) Morfologia vegetal: organografia e dicionário ilustrado de morfologia das plantas vasculares. 2nd edition. Instituto Plantarum, São Paulo, Brazil, 544 pp.

Górniak M, Mytnik-Ejsmont J, Rutkowski P, Tukałło P, Minasiewicz J, Szlachetko DL (2006) Phylogenetic relationships within the subtribe Spiranthinae s.l. (Orchidaceae) inferred from the nuclear ITS region. Biodiversity Research and Conservation 1–2: 18–24.

Govaerts R (2021) World checklist of Orchidaceae. Royal Botanical Gardens, Kew, UK. https://wcsp.science.kew.org/. Accessed on: 2020-05-15.

Guimarães LRS, Caetano JO, Schlemper CR, Couto CCM, Nascimento MV (2016) Novelties in Orchidaceae from the state of Santa Catarina, Brazil. Richardiana 16: 249–257.

IBGE (Instituto Brasileiro de Geografia e Estatística) (1991) Manual técnico da vegetação brasileira. Departamento de Recursos Naturais e Estudos Ambientais, Rio de Janeiro, Brazil, 92 pp.

Heinrich WF (1863) *Eurystyles cotyledon* Wawra. Oesterreichische Botanische Zeitschrift 13(1): 223–225.

INMET (Instituto Nacional de Meteorologia) (2021) Brasília, Distrito Federal. https://portal.inmet.gov.br/. Accessed on: 2020-05-15.

Kocyan A, Qiu YL, Endress PK, Conti E (2004) A phylogenetic analysis of Apostasioideae (Orchidaceae) based on ITS, trnL-F and matK sequences. Plant Systematics and Evolution. 247: 203–213.

Leodegario MM, Cavalcante BP, Aona LYS, Wanderley MGL, Souza FVD, Souza EH (2021) Unexpected finds in Bahia: first records of five species of *Tillandsia* L. (Bromeliaceae). Check List 17 (1): 13–20. https://doi.org/10.15560/17.1.13

Lima JH, Soares-Silva LH (2016) Two new records for Bromeliaceae in the central-west region of Brazil: *Vriesea friburgensis* and *Tillandsia polystachia*. Rodriguésia 67 (4): 1093–1100. https://doi.org/10.1590/2175-7860201667419

Menini Neto L, Almeida VR, Forzza RC (2004a) A família Orchidaceae na Reserva Biológica da Represa do Grama - Descoberto, Minas Gerais, Brasil. Rodriguésia 55 (84): 137–156.

Menini Neto L, Assis LCS, Forzza RC (2004b) A família Orchidaceae em um fragmento de floresta estacional semidecidual, no município de Barroso, Minas Gerais, Brasil. Lundiana 4 (1): 9–27.

Miller D, Warren R (1996) Orquídeas do alto da serra da Mata Atlântica pluvial do sudeste do Brasil. Salamandra, Rio de Janeiro, Brazil, 256 pp.

Oliveira-Filho AT, Ratter JA (1995) A study of the origin of central Brazilian forests by the analysis of plants species distribution patterns. Edinburg Journal of Botany 52: 141–194.

Pessoa E, Alves M (2015) Synopsis of Orchidaceae from Serra do Urubu: an area of montane forest, Pernambuco state, Brazil. Hoehnea 42 (1): 109–133. https://doi.org/10.1590/2236-8906-35/2014

Pridgeon AM, Cribb PJ, Chase MW, Rasmussen FN (2003) Genera orchidacearum vol. 3, Orchidoideae part 2, Vanilloideae. Oxford University Press, New York, USA, 400 pp.

Radford AE, Dickison WC, Massey JR, Bell CR (1974) Vascular plant systematics. Harper & Row, New York, USA, 891 pp.

Ribeiro JF, Walter BMT (2001) As matas de galeria no contexto do bioma Cerrado. In: Ribeiro JF, Fonseca CEL, Silva JCS (Eds.) Cerrado: caracterização e recuperação de Matas de Galeria. Embrapa Cerrados, Brasília, Brazil, 29–47.

Ribeiro JF, Walter BMT (2008) As principais fitofisionomias do Bioma Cerrado. In: Sano SM, Almeida SP, Ribeiro JF (Eds.) Cerrado: ecologia e flora. v. 1. Embrapa Tecnologia e Informação, Brasília, Brazil, 151–212.

Salazar GA, Dressler RL (2011) The leaves got it right again: DNA phylogenetics supports a sister-group relationship between *Eurystyles* and *Lankesterella* (Orchidaceae, Spiranthinae). Lankesteriana 11: 337–347.

Salazar GA, Batista JAN, Cabrera LI, van den Berg C, Whitten WM, Smidt EC, Buzatto CR, Singer RB, Gerlach G, Jiménez-Machorro R, Radins JA, Insaurralde IS, Guimarães LRS, Barros F, Tobar F, Linares JL, Mújica E, Dressler RL, Blanco MA, Hágsater E, Chase M (2018) Phylogenetic systematics of subtribe Spiranthinae (Orchidaceae: Orchidoideae: Cranichideae) based on nuclear and plastid DNA sequences of a nearly complete generic sample. Botanical Journal of the Linnean Society 186: 273–303.

SpeciesLink (2021) SpeciesLink. http://www.splink.org.br/. Accessed on: 2021-05-18.

Szlachetko DL, Mytnik J, Rutkowski P (2001) New species of the genus *Pseudoeurystyles* (Orchidaceae) from Brazil. Polish Botanical Journal 46 (2): 131–132.

The Plant List (2013) The Plant List. Version 1.1. http://www.theplantlist.org. Accessed on: 2021-05-01.

Thiers B (2021) Index herbariorum: a global directory of public herbaria and associated staff [continuously updated]. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/science/ih. Accessed on: 2021-05-18.

Vieira, TL, Barros F (2017) Orchidaceae from Serra do Ouro Branco, state of Minas Gerais, Brazil. Rodriguésia 68 (2): 691–747. https://10.1590/2175-7860201768224

Weberling F (1992) Morphology of flowers and inflorescences. Cambridge University Press, Cambridge, UK, 405 pp.

Zandoná LR, Catharino ELM (2015) Orchidaceae in the Cantareira State Park and its conservation. Revista do Instituto Florestal 27 (1): 83–101. https://doi.org/10.4322/rif.2015.007